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DEVELOPMENT

OF

A PORTABLE DATA RECORDER

TASK III REPORT

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INTRODUCTION

This is the third and final report concerned with the development of a Portable Data Recorder (PDR) for the U.S. Geological Survey (USGS). The first report described the data acquisition requirements for the USGS inspectors with respect to their use of the PDR. The second report presented the rationale for and the design of the keyboard for the PDR. This report represents a detailed test plan for USGS acceptance of the PDR.

The objective of this test plan is to specify the procedures that can be used to properly evaluate the PDR. This objective will be met by accomplishing the following:

- Identify the required operating characteristics.
- Describe the test apparatus to be used.
- Delineate the required test and evaluation procedures.

Each of these areas is fully developed in the following sections.

REQUIRED OPERATING CHARACTERISTICS

The purpose of the PDR is to eliminate or simplify a number of steps in the currently used USGS data handling system. To provide the improvements delineated in the Task I report, the various operational capabilities defined in the Task I report(see Table 1) and keyboard commands defined in the Task II report(see Figure 1) are being implemented in the PDR now being designed.

While the scope of work for the currently funded effort does not include implementation of a field grade device capable of handling all the inspection data currently collected by a team of USGS inspectors, the feasibility for doing this is to be demonstrated. This will be accomplished by implementing the data collection capability for a representative sampling of the various record groups shown in Figure 2. The record groups being imple-

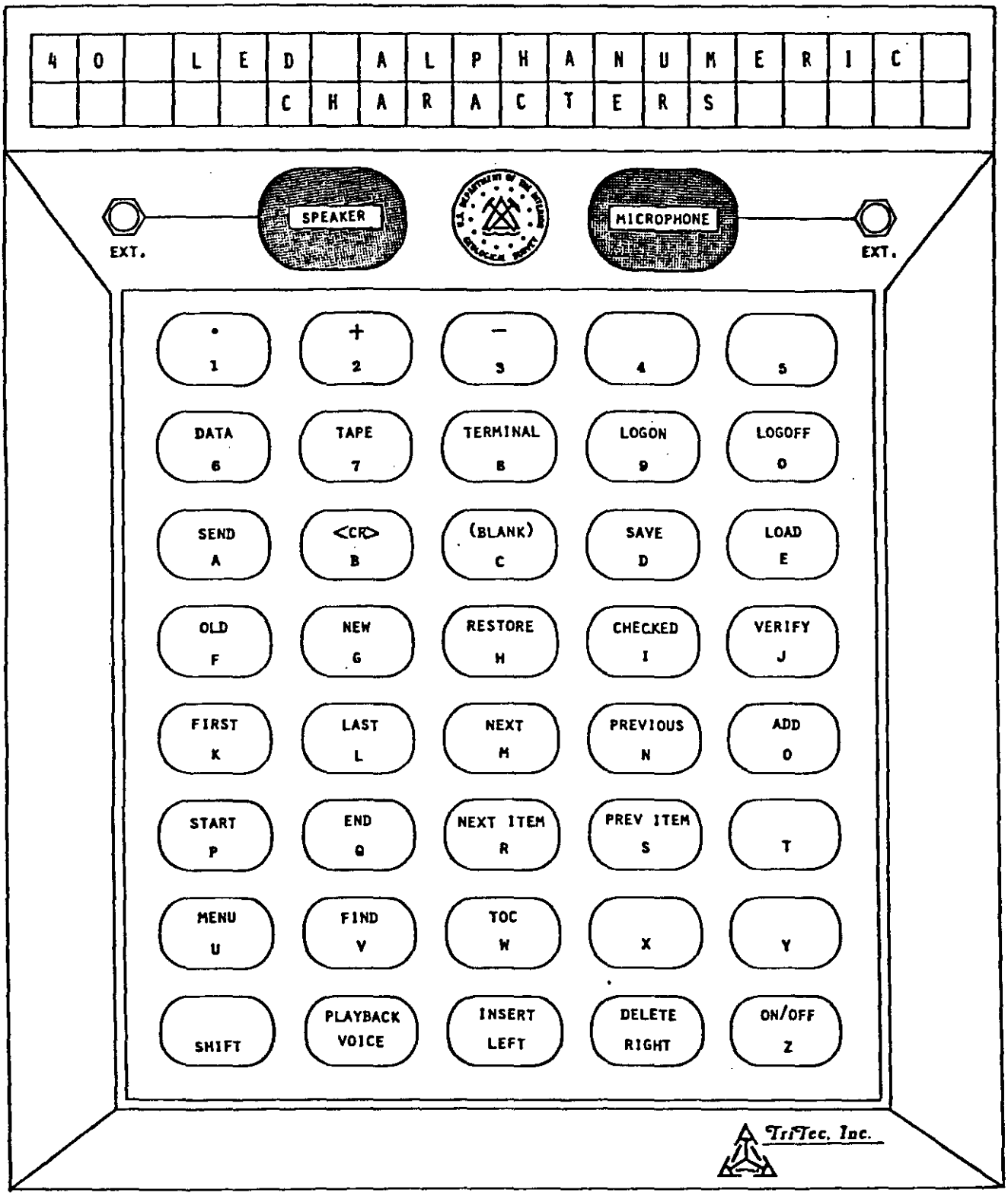
mented include COMPLEX, STATUS, INSPECTION, SUMMARY, ENFORCEMENT, STRUCTURE, WELLBAY, and ATMOSPHERIC VESSELS. The proper test and evaluation of this limited capability as well as a proper estimate of the required power, circuitry, size, weight, cost, and overall operating characteristics of a full capability system will provide the data to properly evaluate the PDR. The following describes what is required to test and evaluate the PDR.

(1)	Manual keyboard entry of digital data.
(2)	Display of digital data as it is entered.
(3)	Format error checking of digital data.
(4)	Verbal input of comments.
(5)	Playback and redisplay of digital data.
(6)	Audio playback of verbal comments.
(7)	Prompting of inspector to aid in his progress through the inspection data acquisition process.
(8)	Editing of digital and verbal data.
(9)	Automatic control of tape cassette drive.
(10)	Data recording or playback via a telephone coupler.
(11)	Format check of data transmitted over telephone coupler.
(12)	Direct generation of computer data records (with verbal comments keypunched).
(13)	Automatic generation of data summaries.

TABLE 1. LIST OF PDR'S OPERATIONAL CAPABILITIES

TEST APPARATUS

There are three main components required to test the PDR. First, there is the PDR itself. The PDR must be used both independently and in conjunction with two other components. These components include a computer terminal and a computer that provides access to either the USGS data base or a reasonable facsimile thereof.



NOTE: TOP DESIGNATION ON EACH BUTTON IS USED WHEN SHIFT BUTTON IS DEPRESSED; BOTTOM DESIGNATION IS FOR USE WITHOUT SHIFT BUTTON.

FIGURE 1. LAYOUT OF PDR DISPLAY AND KEYBOARD

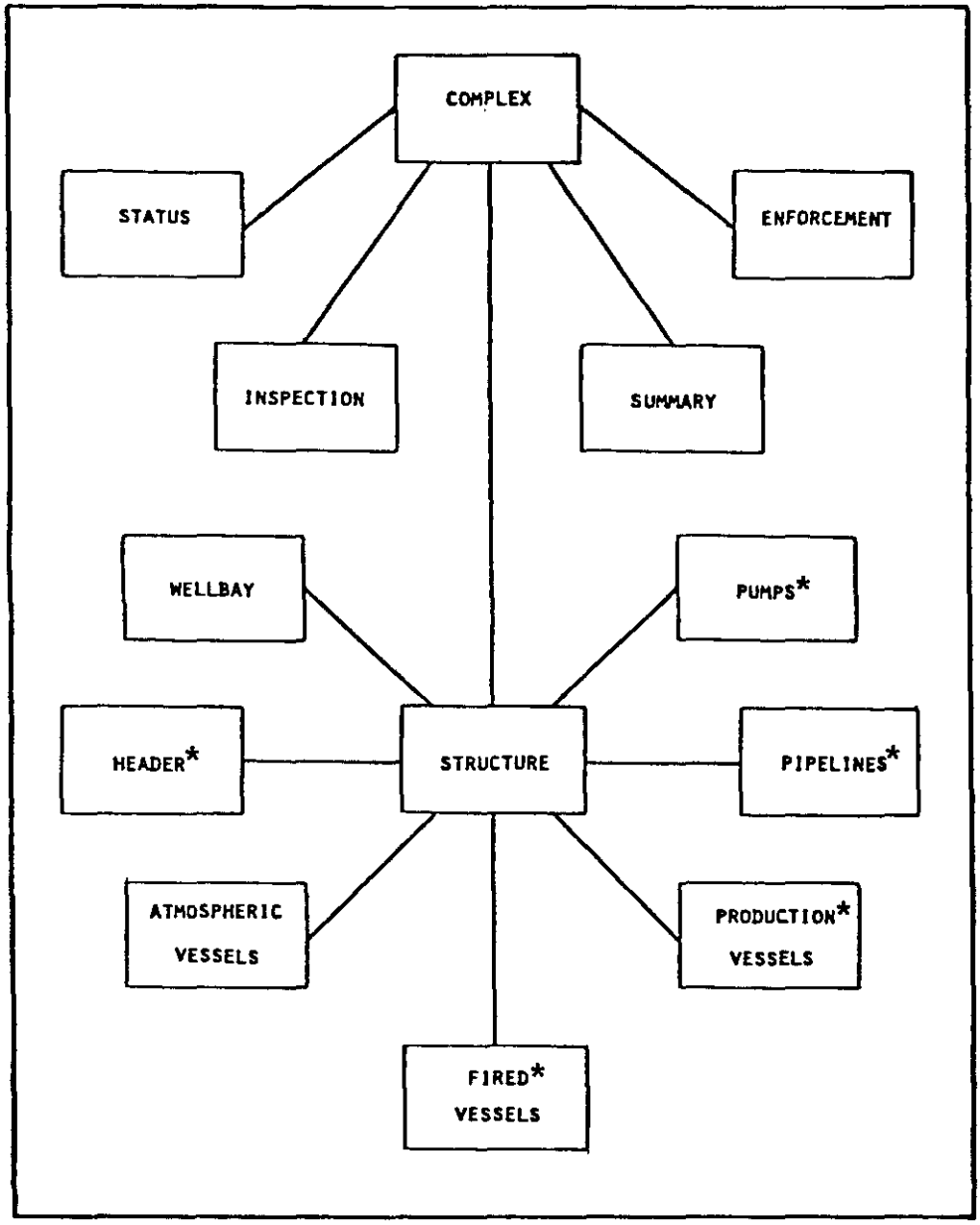


FIGURE 2. DATA STRUCTURE USED BY PDR

The PDR's proper operation in the TAPE and DATA modes must be demonstrated by the manipulation and alteration of its data base while the PDR operates independently of the other test apparatus. The computer and terminal will be necessary to demonstrate the PDR's proper operation in the TERMINAL mode. These two devices are required to allow data transfer to and from the PDR's data base and to provide a convenient means to examine and evaluate overall PDR performance.

TEST PROCEDURES

The entire testing program can be carried out without going offshore. For convenience, it can be conducted at a computer terminal. The test program consists of five phases. These include:

- Data transfer to PDR from computer data base.
- Data transfer between solid-state memory and tape cassette.
- Data entry and manipulation via the keyboard.
- Verbal data entry and playback.
- Data transfer from PDR to computer data base.

Test and evaluation procedures for each of these test phases are described below.

Phase I. Data Transfer To PDR From Computer Data Base

Data transfer from the computer data base to the PDR's solid-state memory will require the use of the computer and terminal. They will be employed to provide as input to the PDR a preexisting data base analogous to that currently used by the USGS.

This phase of the test is conducted in the steps outlined below.

1. Connect the PDR to a modem to allow communication with the computer.
2. Activate the PDR by keying the ON/OFF command and place it in the TERMINAL mode of operation by keying the TERMINAL command.

3. Key LOGON to initiate communications with the computer.
4. Use the PDR keyboard and/or a normal terminal also linked to the computer to input commands that cause the computer to transmit inspection data to the PDR. As a minimum, this data should include three records in each of the record groups listed previously.
5. Key LOGOFF to disconnect the PDR from the modem once the data transmission is complete.

The five steps complete Phase I of the test program.

Phase II. Data Transfer Between Solid-State Memory And Tape Cassette

Upon completion of Phase I the data received from the computer must be stored on tape cassette as a permanent record to allow the PDR user to recover the data for use in the PDR at any time. This capability is demonstrated by the following:

1. Key TAPE to enter the TAPE mode of operation.
2. Key SAVE to store the data transmitted from the computer in Phase I onto the tape cassette.
3. Key ON/OFF to deactivate the PDR and erase the solid-state memory.
4. Key ON/OFF to activate the PDR.
5. Key TAPE to enter the TAPE mode of operation
6. Key LOAD to transfer data from the tape cassette to the solid-state memory.

These six steps complete Phase II of the test program.

Phase III. Data Entry And Manipulation Via The Keyboard

During this phase of the test program the data contained in the PDR's solid-state memory at the end of Phase II is examined to determine its accuracy with respect to that transmitted to the PDR by the computer. This comparison of data is accomplished by means of the commands available on the

PDR keybaord, its 40-character LED display, and a printout of the data values contained in the computer. In addition, the capability of entering and recording current inspection data as outlined in the Task II report is examined.

This phase of the test can be accomplished in the steps below.

1. Key DATA to enter the DATA mode of operation.
2. Compare via the LED display all the data contained in the PDR to the values on a printout representing the data contained in the computer data base. This can be accomplished by proper use of the following commands (see Task II report for explanations of commands): FIRST, LAST, NEXT, PREVIOUS, START, END, NEXT ITEM, PREV ITEM, MENU, FIND, TOC, LEFT, RIGHT. Any discrepancies represent errors in the PDR-computer system and should be noted on the printout.
3. Decide what new data should be used to represent current inspection data. For convenience, this data should be written onto the data printout obtained during Step 2 of this phase of testing.
   In order to check out the ADD command, it is necessary to add at least one record to one or more record groups in the data base.
4. Enter into the PDR solid-state memory the current inspection data generated in Step 3 above. This can be accomplished by use of the display and keyboard with the following commands (see Task II report for explanation of commands): OLD, NEW, RESTORE, CHECKED, VERIFY, FIRST, LAST, NEXT, PREVIOUS, ADD, START, END, NEXT ITEM, PREV ITEM, MENU, FIND, TOC, INSERT, DELETE, LEFT, RIGHT, ., +, -, 0-9, A-Z (See Figure 1).
5. Recheck the new data entered in the solid-state memory against that written on the data base printout sheet in Step 3 above to ensure that the data has been entered correctly. Repeat Step 4 to make corrections as necessary.

6. Key TAPE to enter the TAPE mode of operation.
7. Key SAVE to store this new data on the tape cassette.
8. Key ON/OFF to deactivate the PDR.

These eight steps complete this phase of the test.

Phase IV. Verbal Data Entry And Playback

This part of the test is concerned only with verifying the proper operation of the verbal data (VOICE) and PLAYBACK features. This is accomplished in the following steps:

1. Key ON/OFF to activate the PDR.
2. Key DATA to enter the DATA mode of operation.
3. Key and hold VOICE while speaking into the microphone to record a verbal message.
4. Repeat Step 3 as desired.
5. Key TAPE to enter the TAPE mode of operation.
6. Key PLAYBACK and listen to playback of verbal messages entered in Steps 3 and 4. A failure to playback any of those messages represents an error in the PDR system.
7. Key ON/OFF to deactivate the PDR.

This completes this phase of the test program.

Phase V. Data Transfer From PDR To The Computer Data Base

In this final phase of testing, the ability of the PDR to transmit digital data back to the computer data base will be verified. This is accomplished in the following steps:

1. Physically connect the PDR to a modem and establish a communication link between the computer and PDR.
2. Key ON/OFF to activate the PDR.
3. Key TAPE to enter the TAPE mode of operation.
4. Key LOAD to transfer digital data on the tape cassette to the solid-state memory.

5. Key TERMINAL to enter the TERMINAL mode of operation.
6. Key LOGON to establish communication between the PDR and computer.
7. Key SEND to transmit data from the PDR to the computer's data base.
8. Key LOGOFF to break communications between the PDR and computer.
9. Key ON/OFF to deactivate the PDR.
10. Obtain a printout of the data transmitted to the computer by PDR and compare it to a listing of the data entered into the PDR during Phase III. Any discrepancy should be noted since it represents an error that occurred in the PDR-computer system.

This completes the recommended test program.